

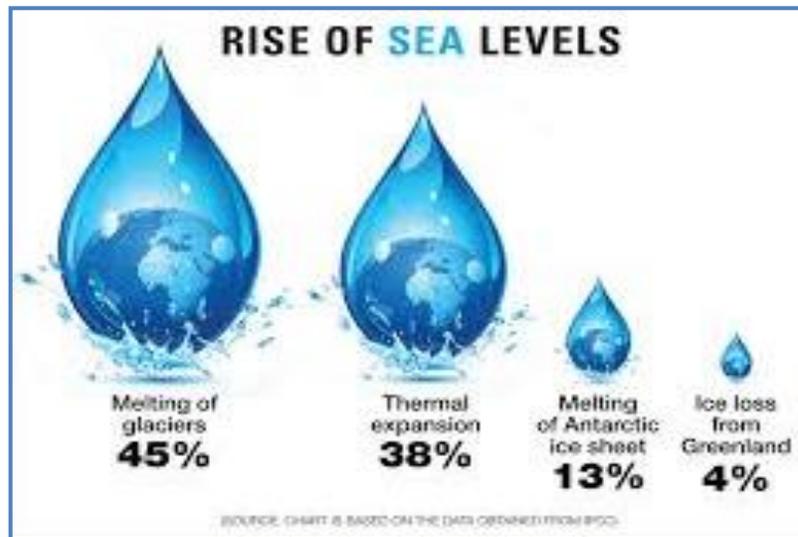


## LAB ACTIVITY: WHAT'S BEHIND SEA LEVEL RISE?

*Sea level* is the average level of the sea after calculating the short-term variations due to wind waves. Regional, short-term sea level is constantly changing due to tidal and wind-driven effects on the ocean. Global sea level has changed throughout Earth's history.

Over the twentieth century, global sea level has risen on the average of 2.0 millimeters (0.08 inches) per year for a total of 10 to 25 centimeters (3.9 to 9.8 inches). According to a recent **Environmental Protection Agency** study, it is expected to rise at least another 20 centimeters (7.8 inches) by 2100. Most experts agree that human-induced global warming is the force behind the current global sea-level rise. When relating to climate change, variations in sea level are the effects of two main factors:

- ✚ Thermal expansion of the water in the ocean; and
- ✚ Exchange of water stored on land by glaciers and ice sheets.



As the global climate warms, the average level of the ocean is also increasing, because warmer water occupies a greater volume. The warmer climate also is causing the melting of mountain and nonpolar glaciers, which adds volume to the oceans.

## Student Sheet 2

It is estimated that most of the increase in sea level will be from the result of global warming, which will cause *thermal expansion* of the oceans. Thermal expansion is caused when seawater expands because of the higher temperature of the water. Since the oceans absorb heat from the atmosphere, when the atmosphere becomes warmer so will the oceans. Warm seawater has a greater volume than cold seawater. As the temperature of the ocean increases so will the total ocean volume. The rising temperatures will also cause the ice and snowfields to melt, in that way adding to the amount of water in the oceans. It is important to understand that only the melting of land-based ice and snow increases sea level. The melting of floating ice will not affect sea level.

**Impacts:** Rising sea level greatly impacts coastal areas. Although an increase in sea level will not necessarily affect the intensity of storms, such as hurricanes, it does increase the vulnerability of coastal areas to severe storms. Coasts are especially densely populated. More than 100 million people are estimated to live within 1 meter (approximately 3 feet) of the present-day sea level. A rise in sea level causes five primary physical effects:

- + erosion of beaches and bluffs;
- + increased flooding and storm damage;
- + flooding of low-lying areas;
- + salt-water intrusion into aquifers and surface waters;
- + and higher water tables.

## ANALYSIS AND CONCLUSIONS:

1. Describe the trend in the graph.
2. What is the relationship between temperature and water volume?
3. Why does water volume increase with increasing temperatures?
4. Are there other causes of sea level rise? If so, what are they, describe them, and how they are influencing sea level
5. How will the change in ocean volume change coastal areas? (Use references for examples to support your answer.)
6. How does this lab model sea level rise with warming temperatures?

Student Sheet 3

DATA TABLE: TIME VS. TEMPERATURE OF WATER

TIME (minutes)	TEMPERATURE (° CELSIUS)	OBSERVATIONS
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Student Sheet 4

GRAPH: TIME VS. TEMPERATURE OF WATER

